

# PATENT COOPERATION TREATY

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## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

|   |  |  |  |                      |
|---|--|--|--|----------------------|
| Applicant's or agent's file reference<br>664543   |  | <b>FOR FURTHER ACTION</b>  |  | See Form PCT/PEA/416 |
| International application No.<br>PCT/JP2004/008934  |  | International filing date (day/month/year)<br>18.06.2004                   | Priority date (day/month/year)<br>19.06.2003 |                      |
| International Patent Classification (IPC) or national classification and IPC<br>C07D405/14  |  |  |  |                      |
| Applicant<br>SUMITOMO CHEMICAL COMPANY, LIMITED et al.  |  |  |  |                      |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 3 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> |  |  |  |                      |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>   |  |  |  |                      |
| Date of submission of the demand<br>05.04.2005  |  | Date of completion of this report<br>05.10.2005                            |  |                      |
| Name and mailing address of the international preliminary examining authority:<br> European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465   |  | Authorized Officer<br><br>Deutsch, W<br><br>Telephone No. +49 89 2399-8281 |  |                      |



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2004/008934

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-56 as originally filed

**Claims, Numbers**

5-7 as originally filed

1-4 filed with telefax on 05.04.2005

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
- \* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2004/008934

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

|                               |             |     |
|-------------------------------|-------------|-----|
| Novelty (N)                   | Yes: Claims | 1-7 |
|                               | No: Claims  |     |
| Inventive step (IS)           | Yes: Claims | 1-7 |
|                               | No: Claims  |     |
| Industrial applicability (IA) | Yes: Claims | 1-7 |
|                               | No: Claims  |     |

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

**Re Item V.**

1 The following documents are referred to in this communication:

- D1 : GB 2 338 240 A (MERCK PATENT GMBH) 15 December 1999 (1999-12-15)
- D2 : US 5 851 427 A (KELLY STEPHEN) 22 December 1998 (1998-12-22)
- D3 : US 5 904 984 A (SU WEI-FANG A ET AL) 18 May 1999 (1999-05-18)
- D4 : US 5 569 727 A (MORMANN WERNER ET AL) 29 October 1996 (1996-10-29)
- D5: BARASKOV N. ET AL.: "Design of New Polymers to Improve Radiation Stability of Plastic Scintillators" PROCEEDINGS OF THE FOURTH INTERNATIONAL CONFERENCE ON CALORIMETRY IN HIGH ENERGY PHYSICS, 1993, pages 542-551, XP009037802 SINGAPORE

**Novelty**

The compounds of the present claims differ from those of D1 through the meanings of Z, in particular the absence of methylene groups adjacent to the 1,3-phenylene group (Z-6).

The compounds of the present application differ from those of D2 through the meaning of the Z group, which does not include naphthalene.

The compounds of the present claims differ from the compounds of D3 either through the presence of the Z group (cf claim 1 of D3 R is (o)) or through the meanings of Y<sup>1</sup> and Y<sup>2</sup> (cf claim 1 of D3, R is (l)) or through the presence of Ar<sup>1</sup> and Ar<sup>2</sup> (cf claim 1 of D3, R is (a)).

The compounds of the present claims differ from those of D4 inter alia through the meanings of Y<sup>1</sup> and Y<sup>2</sup> (cf claim 1 of D4).

The claimed compounds differ from those of D5 through the fact that Z is a 1,3-phenylene group rather than a 1,4-phenylene group.

**Inventive Step**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/JP2004/008934

The closest prior art is considered to be D1 having regard for their structure and in that they are also useful as liquid crystals.

The problem underlying the invention is considered to be the provision of further compounds useful as liquid crystals.

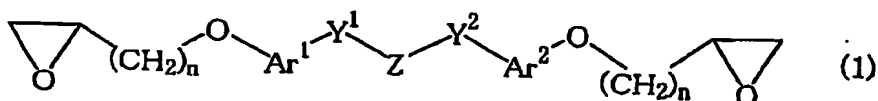
In view of the structural differences with the D1 compounds the present claims are not considered to be obvious.

**re item VII**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 to D5 is not mentioned in the description, nor are these documents identified therein.

## CLAIMS

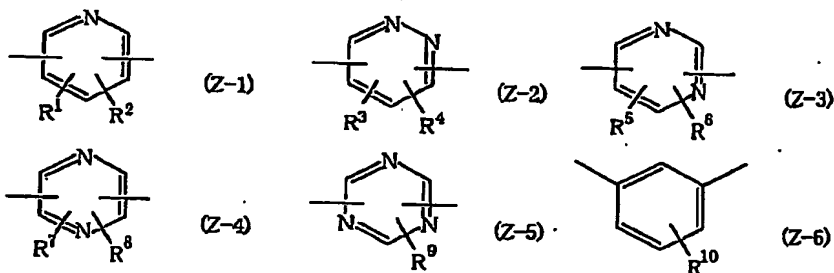
1. An epoxy compound of formula (1):



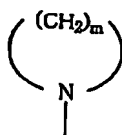
wherein n represents an  
5 integer of 1 to 9,

the  $-(CH_2)_n-$  group may have inserted  $-O-$ , or  $-N(R')-$ ,  
between the methylene groups, wherein  $R'$  represents a  
hydrogen atom or a  $C_{1-18}$  alkyl group,

Z represents any one of divalent groups of the  
10 following general formulas (Z-1) to (Z-6):

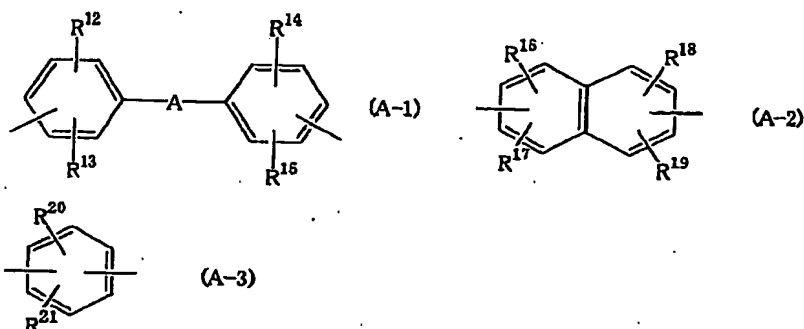


wherein  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^8$ ,  $R^9$  and  $R^{10}$  are the  
same or different and represent independently a hydrogen  
atom, a  $C_{1-18}$  alkyl group, an amino group substituted with  
15 one or two  $C_{1-18}$  alkyl groups, or a cyclic amino group of  
the following formula:

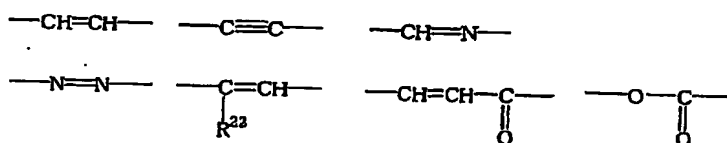


wherein  $m$  represents an integer of 4 to 12, and one methylene group or two or more not neighboring methylene groups of the  $C_{1-18}$  alkyl group or groups as defined in connection with  $R^1$ ,  $R^2$ ,  $R^3$ ,  $R^4$ ,  $R^5$ ,  $R^6$ ,  $R^7$ ,  $R^8$ ,  $R^9$  or  $R^{10}$ , and of the cyclic amino group, may be replaced with  $-O-$ ,  $-NH-$ ,  $-N(R'')$  or  $-S-$ , wherein  $R''$  represents a  $C_{1-18}$  alkyl group,

$Ar^1$  and  $Ar^2$  are the same or different and represent any one of groups of the following formulas (A-1) to (A-3):



10. wherein  $A$  represents a single bond or any one group selected from the group consisting of:

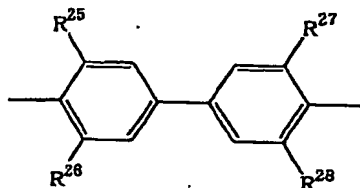


15. wherein  $R^{12}$ ,  $R^{13}$ ,  $R^{14}$ ,  $R^{15}$ ,  $R^{16}$ ,  $R^{17}$ ,  $R^{18}$ ,  $R^{19}$ ,  $R^{20}$ ,  $R^{21}$  and  $R^{22}$  are the same or different and represent independently a hydrogen atom, a halogen atom, a  $C_{1-18}$  alkyl group, a  $C_{1-8}$  alkoxy group, a cyano group, or a nitro group,

$Y^1$  and  $Y^2$  are the same or different and represent a single bond,  $-O-$ ,  $-S-$ , or  $-Si(R^{23})(R^{24})-$ , wherein  $R^{23}$  and  $R^{24}$

are the same or different and represent independently a lower alkyl group or a phenyl group.

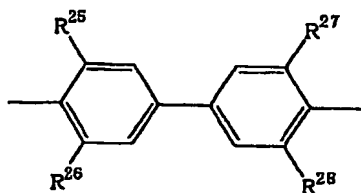
2. The epoxy compound according to claim 1, wherein Ar<sup>1</sup> and Ar<sup>2</sup> in formula (1) are the same or different and represent independently a group of the following formula:



wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup> and R<sup>28</sup> are the same or different and represent independently a hydrogen atom or a methyl group.

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3. The epoxy compound according to claim 1, wherein Ar<sup>1</sup> and Ar<sup>2</sup> in formula (1) represent the same group of the following formula:



- 15 wherein R<sup>25</sup>, R<sup>26</sup>, R<sup>27</sup> and R<sup>28</sup> are the same or different and represent independently a hydrogen atom or a methyl group.

4. An epoxy composition, which comprises the epoxy compound as defined in any one of claims 1 to 3 and a curing agent.

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